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Highways England and Incident Management Study

Final Report

Prepared for the Office
of Rail and Road

19/12/2018

ORR: Highways England and Incident Management Study

Introduction and study information sources

Study scope and timeline

This study is a snapshot of Highways England's incident management (IM) practice based on a sample of nine interviews with Highways England conducted over a five week period. Findings and recommendations are based on Highways England engagement as well as on a review of IM literature and a comparator survey of UK and international IM organisations.

Introduction and objectives

The study has been carried out for the Office of Rail and Road (ORR). The objectives were to:

1. Understand and compare how Highways England, comparable road authorities and other relevant organisations manage, measure, target and incentivise clearing incidents from their networks.
2. Use comparator assessment to deliver a final report summarising the findings of the above and, where appropriate, to set out recommendations for Highways England's consideration.
3. Understand the comparability of performance measures of incident management (IM) between Highways England and other comparators.

Study information sources

A number of sourcing methods were used to develop the study findings and recommendations:

Highways England engagement – site visits and staff interviews with the Incident Management Requirements Team (IMRT), National Traffic Operations Centre (NTOC), West Midlands Regional Control Centre (RCC), South West Regional Operations Centre (ROC), M25 DBFO, East RCC, Strategy & Planning Directorate and Commercial & Procurement Directorate.

Cross-sector UK and international IM comparator survey – review and analysis of responses from UK highway, UK infrastructure and international road organisations involved in IM.

IM literature review – compilation of UK and international incident management guidance; triage based on the relevance to this study and potential learning to Highways England and review of selected documents.

Thank you - We would like to thank Highways England and all those organisations that took part in this study for their time and for sharing information on UK and international IM practice.

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Report contents and notice

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Notice

This report has been prepared by Elliott Asset Management Ltd (EAM) on the basis of the Form of Agreement with the Office of Rail and Road (ORR) dated 1st October 2018, in relation to contract CT/18-35. This report is for the benefit and information of ORR.

All surveys, observations, analysis and forecasts contained in the report have been made on the basis of the information available at the time of the study and have been prepared as at 15th December 2018. EAM cannot be liable for any subsequent changes.

In preparing the report, EAM has relied upon, and assumed the accuracy of, information obtained from a variety of sources, including but not limited to: data provided by Highways England; interviews with members of Highways England and its supply chain and representatives of industry associations; interviews with road and non-road operators; published academic and technical information.

EAM accepts no responsibility and will not be liable in the event that information provided to EAM during the course of the assignment from such sources and relied upon by EAM is subsequently found to be inaccurate.

ORR: Highways England and Incident Management Study

Executive summary findings and recommendations

Key messages

F0. Highways England is recognised as a European leader in incident management (IM). Highways England exceeded its target for incident clearance in 2017-18 both nationally and across its regions.

R0. Nevertheless, this study has identified a number of potential opportunities where Highways England could improve IM practice and incident clearance.

Consistency of IM approach

F1. Highways England manages its Strategic Road Network (SRN) through six regions which have devolved IM decision-making responsibilities. Each region covers several Police forces and other emergency services, and multiple local highway authorities (LHAs). This means there are many interdependencies involved in incident management.

F2. Highways England's transition to the Asset Delivery (AD) model and new Regional Operations Centres (ROCs) will allow Traffic Officers (TOs) full network management control, resource flexibility and the potential to improve IM efficiency.

F3. Highways England's draft national Incident Management Manual (IMM) and Concept of Operations (CoO) guidance will help standardise IM across all regions.

F4. Highways England employs competent experienced IM staff. Significant decision-making is devolved to on-road and control centre incident operator TOs. Staff receive regular training and coaching.

R1. Highways England should continue its roll-out of IMM and CoO guidance to regions. Highways England should mitigate the risk of reliance on key IM staff, in particular control centre incident operators, through effective succession planning.

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Executive summary findings and recommendations

Stakeholder liaison

F5. The relationship between Highways England and the Police is critical to IM and based on established practice such as JESIP and CLEAR principles. However the level of traffic incident experience may vary between police responders on the ground.

F6. Emergency services may have different priorities to TOs during an incident. Regional variances in Police experience can result in different IM practices. This can impact Highways England's ability to clear and manage incidents.

F7. Highways England regions intersect with multiple LHAs who have varying levels of emergency contact. This can create difficulties for TOs coordinating traffic diversions, particularly outside daytime hours.

F8. As a Category 2 responder under the Civil Contingencies Act, Highways England is a member of Local Resilience Forums (LRFs), and through the LRFs supports Category 1 responders, including emergency services and local authorities, in developing multi-agency plans for provision of welfare to customers in trapped traffic. This relationship is not universally understood by road users which can result in differing expectations of Highways England's role.

R2. Highways England should consider ways to improve the coordination and understanding of IM with the Police at a national level which should lead to better understanding of incident roles and responsibilities at a local force level.

R3. Highways England should continue to develop tailored local IM protocols based on JESIP and CLEAR principles with the Police, other emergency services and other stakeholders, to clarify responsibilities and support Highways England's ability to clear and manage incidents.

R4. Highways England should work with LHAs at a national and regional level to develop more consistent liaison processes and 24/7 contact procedures.

R5. Highways England should continue to support LRFs in seeking ways to distribute welfare effectively, in particular to vulnerable road users.

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Executive summary findings and recommendations

Opportunities and impact from innovation

F9. Highways England has many examples of local innovation and good practice leading to improved incident clearance.

F10. The introduction of technology on smart motorways has allowed all-lane running (ALR) in order to increase capacity. During an incident, the smart technology can be used to open up traffic free corridors to allow emergency services, service providers and vehicle recovery to access the incident.

R6. Highways England should ensure that smart motorways and roads with discontinuous hard shoulders continue to benefit IM and do not constrain access to incidents or the provision of welfare to road users.

R7. Highways England should ensure that local innovation and good practice that can benefit IM is brought into routine operation nationally as quickly as possible.

R8. Highways England should consider whether international practices such as a national traffic radio channel (used in France) and a 3-digit national emergency number for traffic incidents shared with emergency services (used in Denmark) would benefit IM.

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Executive summary findings and recommendations

Performance measures

F11. Highways England's KPI for incident clearance is limited to motorways and for incidents that occur within certain hours. Future IM metrics are being considered as part of the development of the second Road Investment Strategy (RIS 2).

F12. Highways England exceeded its target for incident clearance in 2017-18 both nationally and across its regions.

F13. Highways England's incident clearance KPI is well understood. The need to reopen roads and clear incidents quickly will always need to be carefully managed with Highways England's safety imperative.

F14. Most other countries surveyed have either a response or clearance time based measure for incident clearance. Some countries measure other service aspects.

R9. Highways England should ensure that the incident clearance KPI continues to drive the right behaviours.

R10. In the development of performance measures for RIS2 and future road periods, Highways England should consider how it can improve incident management data across the whole SRN.

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Executive summary findings and recommendations

Levels of service

F15. Highways England regularly monitors motorways using TO patrols and traffic detection technology. Recent deployment of single TO crews to appropriate incidents provides resource flexibility and balances efficiency with customer needs.

F16. There is less patrolling of APTRs by Highways England and more reliance on traffic flow technology, external incident reporting, and attendance and communication by the Police at incidents. These factors could cause a delay in the TO and service provider response in circumstances where their response is required.

F17. Other countries operate a single level of service for IM across their entire network, or adjust their level of service based on the likelihood of incidents and the needs of their network.

R11. Highways England should consider whether its current approach to managing incidents on APTRs offers road users an appropriate level of service compared to that on motorways.

Background

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Background context on the Office of Rail and Road's (ORR) monitoring role and Highways England's incident management and measurement

ORR IM monitoring

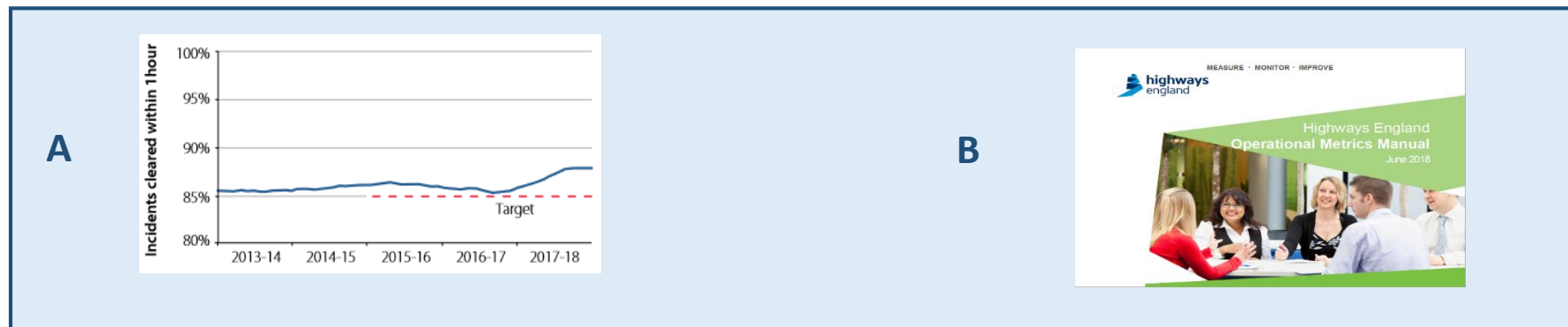
ORR monitors Highways England's performance against the outcomes set out in the **Road Investment Strategy (RIS)**. This includes a target to clear 85% of motorway incidents within one hour.

ORR's **Annual Assessment of Highways England's Performance, (April 2017 – March 2018)** showed that the company met its incident clearance target in 2017-18, clearing 87.9% of motorway incidents within one hour, an improvement on its performance in 2016-17 when it cleared 85.9% of incidents within one hour (**A**). In addition ORR reported Highways England improvements in the capability of its Traffic Officers (TOs) through additional training, increased network coverage and better targeting of known hotspots.

Highways England IM performance

Highways England's incident clearance KPI is one of two indicators that measure its performance in supporting the smooth flow of traffic as defined in the Operational Metrics Manual (OMM) (**B**). The other is network availability. The incident clearance measure is only used on the motorway network and not between 10pm and 6am.

Examples of improvements by Highways England in the 2017-18 period reported by ORR in its **Annual Assessment** that benefit incident clearance include strategic positioning of TO vehicles during severe weather, better regional emergency service coordination and a national driver education campaign on using smart motorways.



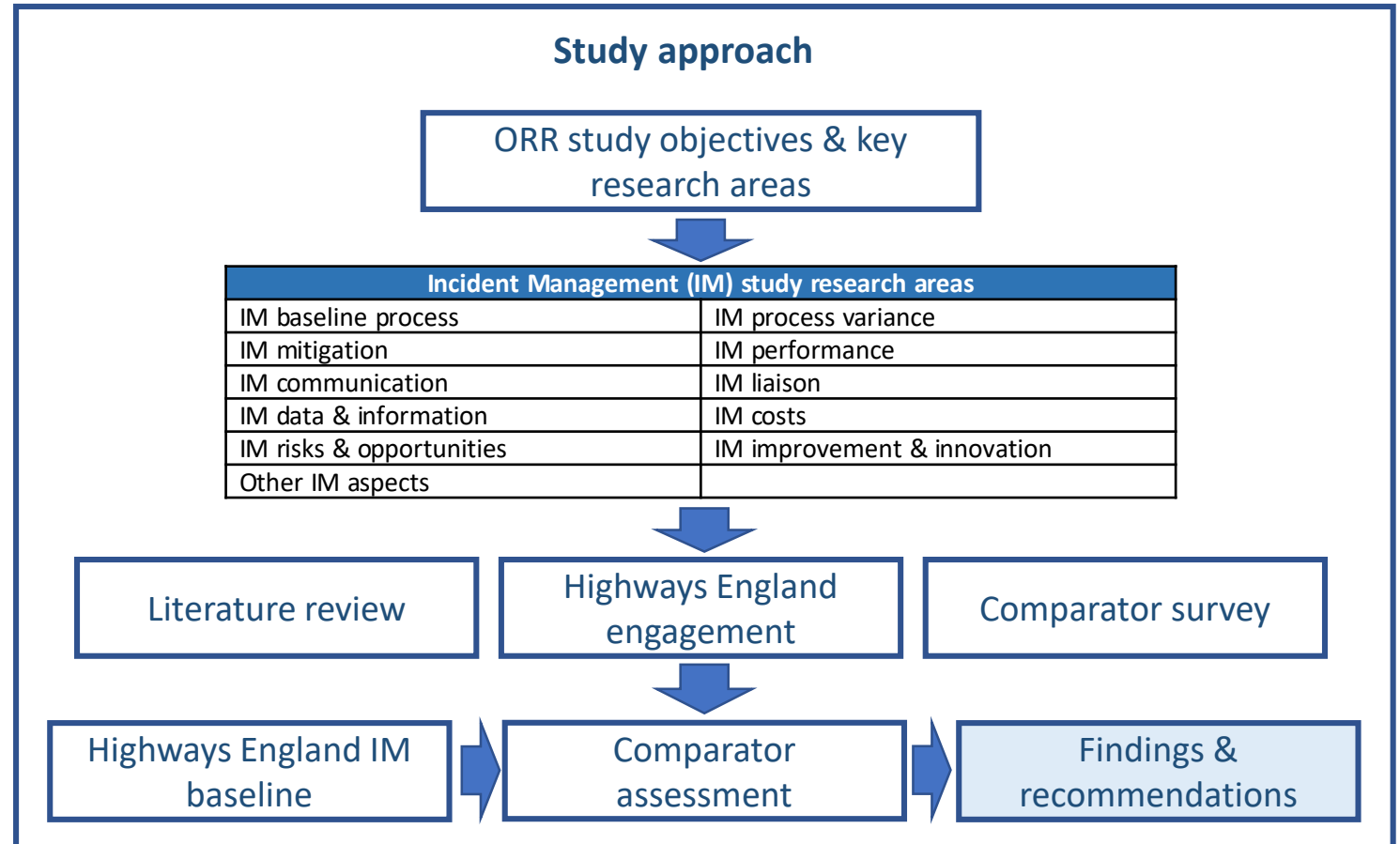
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EAM has been commissioned by the Office of Rail and Road to review Highways England’s approach to incident management and to compare this to comparator organisations.

Study objective(s)

1. Understand and compare how Highways England, comparable road authorities and other relevant organisations manage, measure, target and incentivise clearing incidents from their networks.
2. Use comparator assessment to deliver a final report summarising the findings of the above and, where appropriate, to set out recommendations for Highways England’s consideration.
3. Understand the comparability of performance measures of incident management between Highways England and other comparators.

The working definition of an incident for this study was “an unplanned event with a lane closure aspect, complete, partial or rolling (including on APTR roads)”.



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How Highways England, comparable road authorities and other relevant organisations manage, measure, target and incentivise clearing incidents from their networks.

Scope by key research areas

The study considered four research areas:

Processes

- This focussed on the Highways England IM process timeline, governance and responder roles and responsibilities
- Interviews were held with Highways England staff (national and regional) and literature searches were carried out to develop a survey to split down the IM process into 'decision making elements'
- Analysis of comparator survey results provided possible process enhancement or risk reduction.

Measurement and metrics

- This documented the Highways England measurement process and split it into the elements that could be used to identify improvements
- The comparator survey was used to document and analyse IM definitions, performance frameworks, calculation and monitoring of IM measures and their relationship with other operational KPIs
- Road user views such as Transport Focus's NRUSS survey were used to identify potential improvements in IM measures
- The wider costs of incident decision making were considered such as thresholds for asset removal to speed up IM clearance.

Targets and incentives

- This researched incentivising IM clearance and decreasing the risk of incident escalation
- The comparator survey was used to identify operational factors and dynamic intelligence used to make decisions to achieve and consistently improve target performance
- Study analysis focussed on types and impact of penalties for poor performance and implications for IM performance

Interaction with other KPIs

- This identified known and assessed relationships between Highways England KPIs that impact on incident clearance, lane availability and average delay
- The comparator survey was used to identify other road agency views on relationships between KPIs and data collection

Methodology

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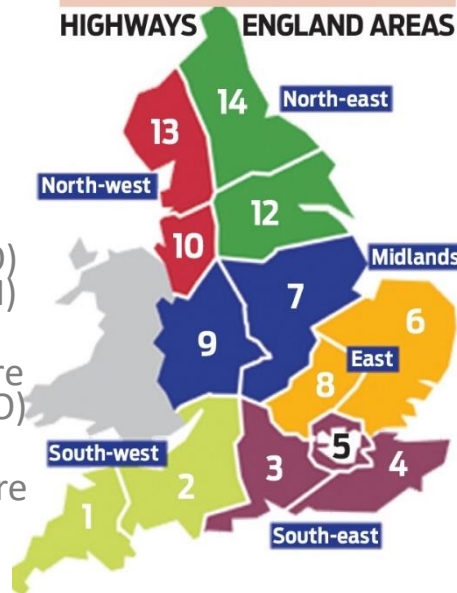
To understand and describe Highways England's incident management baseline process and any regional and other variances through interviews and information collection.

Highways England national and regional engagement

A series of visits to Highways England traffic and operational centres were undertaken as well as meetings and calls with Highways England staff to understand the baseline IM process and how this varies regionally.

The following visits and calls were made over a five week period:

- Incident Management Requirements Team (IMRT), Bristol
- National Traffic Operations Centre (NTOC), Birmingham, housing the National Incident Liaison Officer (NILO) and National Network Manager (NNM) functions
- West Midlands Regional Control Centre (RCC), Birmingham – Traffic Officer (TO) functions
- South West Regional Operations Centre (ROC), Bristol – TO functions
- Strategy & Procurement Directorate, Operational Research & Regulatory Compliance teams, teleconference
- Commercial & Procurement Directorate, teleconference
- M25 DBFO and East RCC, South Mimms – service provider and TO functions.



The national and three regional centres (West Midlands, South West and East) were selected to provide examples of how IM practice varies under Highways England's network management and maintenance contract operating models. The two regional models are:

- 'As-Is' operating model – this applies to 5 regions and comprises a Regional Control Centre (RCC) managed and operated by TOs with a Network Control Centre (NCC) operated by the Asset Support Contract (ASC) service provider/maintainer. The aim is to transition these 5 regions to the 'to-be' model below by 2021.
- 'To-Be' target operating model – this applies to the South West only and comprises a Regional Operations Centre (ROC) operated by TOs only (fulfilling all previous RCC/NCC roles) with maintenance support provided by the Asset Delivery (AD) maintenance supplier.

Highways England's transition programme to the target operating model by 2021 is being carried out through either 'progressive AD contracts' or replacement of ASC contracts with AD contracts.

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To compare Highways England’s approach to incident management with comparator organisations.

Comparator assessment

An assessment was carried out to identify those UK and international organisations that could bring potential learning to Highways England under the four research areas. Three organisation types were chosen:

- UK domestic highways
- UK domestic infrastructure
- International road agencies

UK domestic highways – these are organisations associated with UK strategic and local highway operations including transport bodies, IM stakeholders, IM providers and maintenance providers.

UK domestic infrastructure – these are non-highways organisations such as utilities who practice IM and are responsible for ensuring service delivery to customers.

International road agencies – a range of European and international road agencies were selected to identify good and best practice that could become learning opportunities for Highways England.

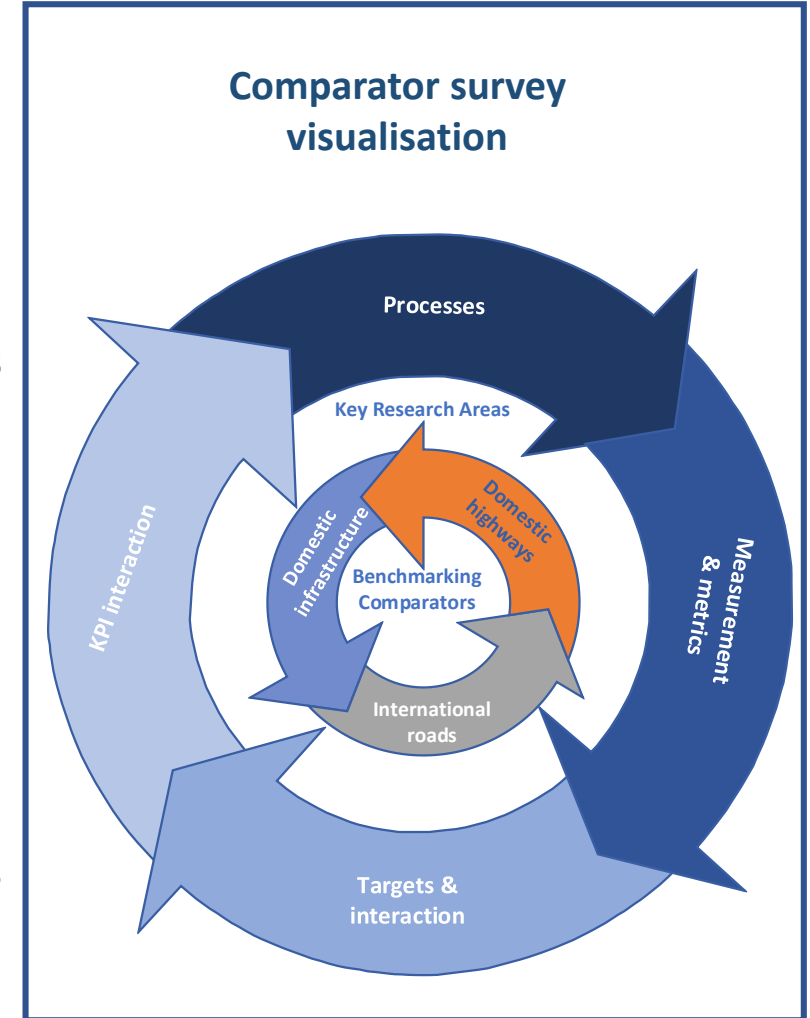
A survey was used to collect and analyse responses under four themes:

- A) Incident management processes
- B) Measurement and metrics
- C) Targets and incentives
- D) Interaction between performance measures

Survey responses and analysis

24 survey responses were received from organisations involved in IM representing the UK and 10 other countries.

Analysis from the comparator survey results is presented in later pages of this document.



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To identify information sources of relevance to highway and non-highway incident management and of specific potential interest to Highways England.

Literature review

A review of UK and international literature relating to incident management was undertaken to inform the design of the comparator survey.

A total of 106 documents or web sources were captured and reviewed against the following criteria:

- Description and reference and type:
 - General background – does not offer potential for Highways England IM learning
 - Future direction – identifies future IM challenges of potential interest to Highways England IM
 - Highways England specific – current Highways England IM guidance or case studies
 - Potential comparison – of interest to compare to Highways England IM

From the review each source was given a High, Medium, Low value for further input to the study.

Literature type	Count	Percentage	Study Value		
			High	Medium	Low
Future direction	5	5%	2	2	1
General background	26	25%	0	8	18
Highways England specific	33	31%	25	6	2
Potential comparison	42	40%	19	20	3
Total	106	100%	46	36	24
			43%	34%	23%

Initial literature assessment

- **General finding** – many of the UK and international sources describe a similar approach to incident management
- **General finding** – those sources that discuss the future direction of road networks, such as connected and autonomous vehicle technology (CAV), do not discuss the future impacts on road authority incident management.
- **Highways England literature** – sources range from national IM strategy to current and emerging IM guidance aligned to the different regional operating models. As such there is no single documented IM model process manual.
- **UK and international comparison literature** – potential comparison sources come from other European and international IM studies, notably from the Conference of European Directors of Roads (CEDR) and the Danish Road Directorate (DRD), as well as non-Highways England UK road agencies and Transport for London (TfL).

There are several findings across all research areas which have potential for Highways England to improve IM. These are documented in later pages.

Highways England incident management approach

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Overview of Highways England's approach to incident management

Highways England operates a regional approach to IM with strategic level communication and network management at a national level. It is transitioning from a Regional Control Centre (RCC) model to a Regional Operations Centre (ROC) model. The key benefit of the ROC is being able to deliver full regional network management duties using Highways England employed staff and with less reliance on service providers. This provides flexibility and potential for efficiency.

Different maintenance contracts to support the ROC and RCC operating models introduce different responsibilities between Highways England and its service providers with respect to IM.

The motorway network and some APTRs are patrolled by Highways England TOs at certain times of day. Incidents are detected by various means including roadside technology, reports through the Police as 999 calls, calls direct to Highways England, reports by service providers and vehicle recovery organisations.

Depending on the type of incident other stakeholders such as emergency services and LHAs may be involved in incident detection and response.

Highways England TOs have statutory powers to move vehicles and can use the national vehicle recovery contract (NGVR). Highways England service providers are involved in attending incidents, asset repair and clearing debris to enable the road to be reopened.

Welfare to drivers affected by incidents is provided through Local Resilience Forums (LRFs). Highways England supports the LRFs.

General incident communication to the public is provided through variable message signs (VMS), Twitter alerts, media, the Traffic England website and links to external sites. Some incident communication is carried out at a national level but is planned to be regionalised in 2019. Strategic VMS are controlled by NTOC and supplement regionally controlled VMS.

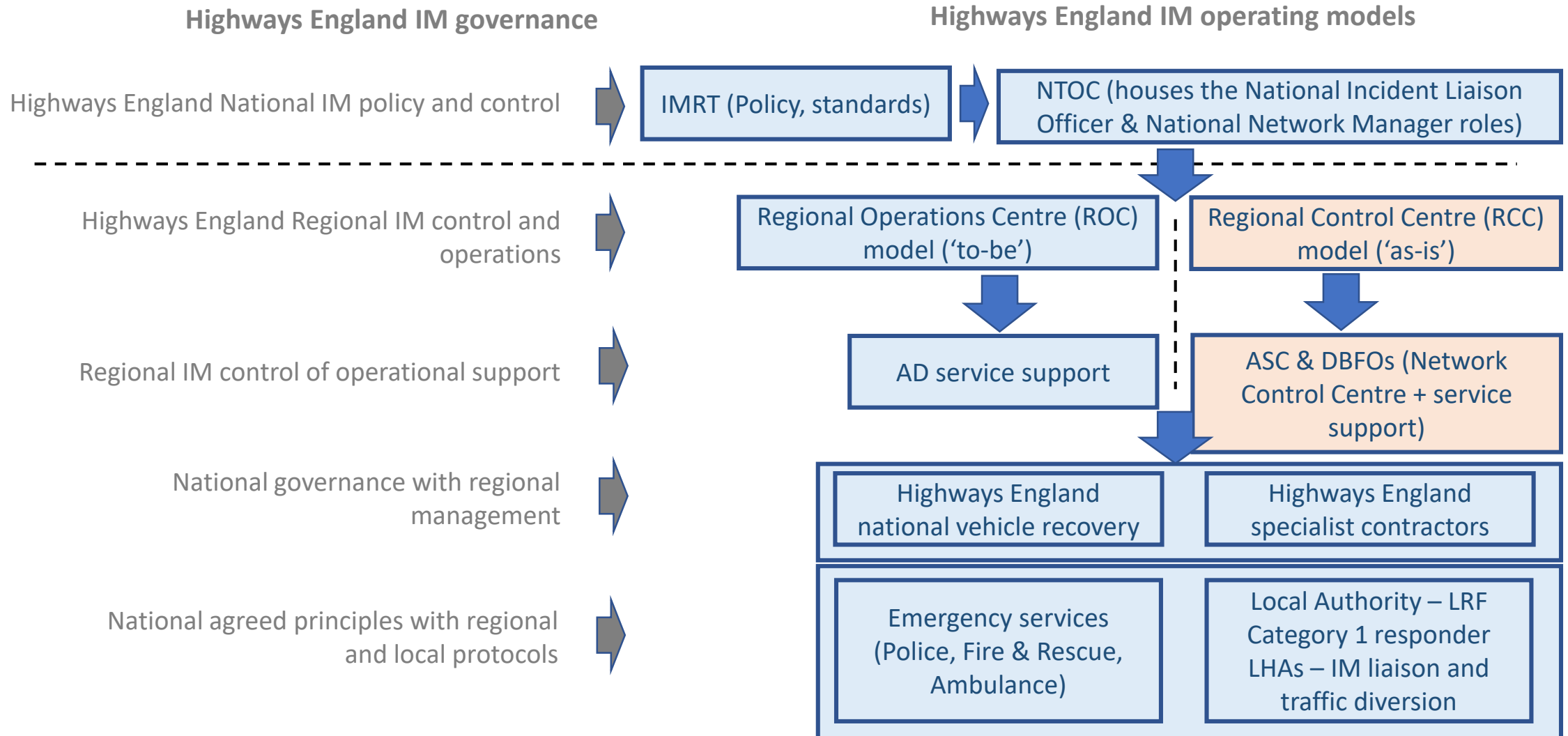
There are established debrief procedures following incidents that identify lessons learned and improvements. These range from hot, cool and cold debriefs depending on the incident severity and timescale.

Highways England is held to account against its incident clearance KPI. Information on incident clearance times is collected and analysed centrally to calculate the KPI.

The diagram on the next page illustrates Highways England's IM governance and operating model structure.

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Highways England governance of incident management



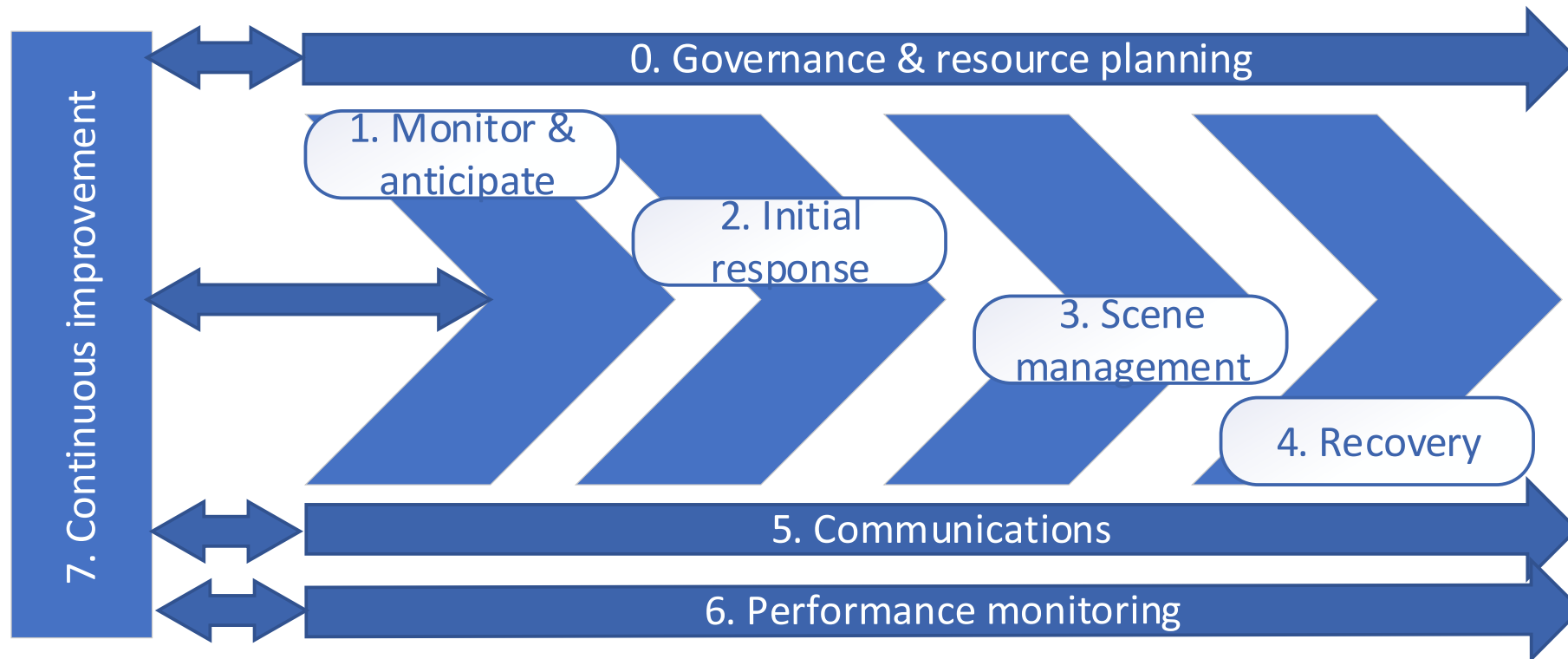
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Incident management process model

IM process model

Based on the draft Highways England Incident Management Manual (IMM) timeline process and comparable IM processes from the literature review, a process model with eight incident management elements (0 to 7) has been developed to categorise the findings from Highways England engagement.

The process model includes four key incident process steps (1 to 4) and three continuous activities (0, 5 and 6). Continuous improvement (7) is shown as interfacing with all process activities.



Study Incident Working Definition
“an unplanned event with a lane closure aspect, complete, partial or rolling (including on APTR roads)”.

Findings from Highways England engagement

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Findings - Introduction

Development of findings and recommendations

Findings have been identified from the results of Highways England engagement, comparator survey analysis and the literature review.

Findings from engagement with Highways England are shown on the following pages against each process stage 0 to 7. **Higher priority findings are in bold.**

Findings from the comparator survey and literature review are shown in later pages.

Key findings (Fx.) and recommendations for Highways England (Rx.) have been extracted and synthesised into five categories:

- **Consistency of IM approach**
- **Stakeholder liaison**
- **Opportunities and impact from innovation**
- **Performance measures**
- **Levels of service**

Key messages

Highways England is recognised as a European leader in incident management (IM). This finding has been reached from a combination of the results of engagement with Highways England TO staff from both national and regional teams, the findings from the comparator survey and the review of European and international IM literature. The latter included two European IM benchmarking studies where Highways England and Netherlands IM practice is seen as leading in Europe. Highways England has improved its incident clearance performance over several years and has exceeded its clearance target in 2017-18 both nationally and across its regions.

F0. Highways England is recognised as a European leader in incident management (IM). Highways England exceeded its target for incident clearance in 2017-18 both nationally and across its regions.

R0. Nevertheless, this study has identified a number of potential opportunities where Highways England could improve IM practice and incident clearance.

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Findings - Process stage 0 : Governance and resource planning

Brief description and responsibilities

This includes national incident management policy and guidance and regional guidance. It also includes IM resource planning, competency assessment and training, different contract models and governance arrangements

Key findings from Highways England engagement

0.1 There doesn't appear to be a standard IM process used consistently across Highways England regions. However there is evidence of good IM practice and we are aware of the new Incident Management Manual (IMM) and Concept of Operations (CoO) guidance. The IMM and CoO are being rolled out to all regions in 2019.

0.2 We are aware of the development of a standardised process and narrative by Highways England to support the move to the ROC operating model aligned to the progressive roll-out of the AD contract. This is in the IMM and CoO guidance (currently in draft) as part of the ROC model. The ROC offers full network management control, flexibility of TO resources and potential efficiencies.

0.3 IM decision-making has been devolved to the Highways England regions. The different operating models (AD/ASC/DBFO) result in variation in IM practice & obligations under contracts. Highways England needs to ensure all Traffic Officers (TOs) understand these different operating practices. In some cases the jurisdictional boundaries between RCCs and DBFOs don't align. This can create interface issues.

0.4 IM works well in Highways England because there are competent experienced people at all levels. There is a lot of responsibility on those individuals to make informed decisions.

0.5 The reliance on the experience and judgement of key individuals presents a risk to Highways England if they leave as well as creating an issue of succession planning.

0.6 Regions operate a graded training programme for TO control centre and on-road staff including foundation and additional levels. Coaching is used to develop staff, in particular control centre operators.

0.7 The relationship between Highways England and the Police is critical to successful IM. The matrix of Highways England regions and local Police forces can lead to significant variation in operational practices. There is a need for national consistency with the Police relationship including mutual understanding of roles and responsibilities and expectations (in terms of reporting incidents and on-site).

0.8 Local authorities are a Category 1 responder under the Civil Contingencies Act 2004 and are responsible for welfare provision to trapped traffic through the Local Resilience Forums (LRFs) together with emergency services and other Category 1 responders. Highways England is a Category 2 responder and supports the LRF. This relationship is not universally understood by road users which can result in differing expectations of Highways England's role.

ORR: Highways England and Incident Management Study

Findings - Process stage 0 : Governance and resource planning

Summary findings and recommendations

F1. Highways England manages its Strategic Road Network (SRN) through six regions which have devolved IM decision-making responsibilities. Each region covers several Police forces and other emergency services, and multiple local highway authorities (LHAs). This means there are many interdependencies involved in incident management.

F2. Highways England's transition to the Asset Delivery (AD) model and new Regional Operations Centres (ROCs) will allow Traffic Officers (TOs) full network management control, resource flexibility and the potential to improve IM efficiency.

F3. Highways England's draft national Incident Management Manual (IMM) and Concept of Operations (CoO) guidance will help standardise IM across all regions.

F4. Highways England employs competent experienced IM staff. Significant decision-making is devolved to on-road and control centre incident operator TOs. Staff receive regular training and coaching.

F5. The relationship between Highways England and the Police is critical to IM and based on established practice such as JESIP and CLEAR principles. However the level of traffic incident experience may vary between police responders on the ground.

F6. Emergency services may have different priorities to TOs during an incident. Regional variances in Police experience can result in different IM practices. This can impact Highways England's ability to clear and manage incidents.

F7. Highways England regions intersect with multiple LHAs who have varying levels of emergency contact. This can create difficulties for TOs coordinating traffic diversions, particularly outside daytime hours.

F8. As a Category 2 responder under the Civil Contingencies Act, Highways England is a member of Local Resilience Forums (LRFs), and through the LRFs supports Category 1 responders, including emergency services and local authorities, in developing multi-agency plans for provision of welfare to customers in trapped traffic. This relationship is not universally understood by road users which can result in differing expectations of Highways England's role.

R1. Highways England should continue its roll-out of IMM and CoO guidance to regions. Highways England should mitigate the risk of reliance on key IM staff, in particular control centre incident operators, through effective succession planning.

R2. Highways England should consider ways to improve the coordination and understanding of IM with the Police at a national level which should lead to better understanding of incident roles and responsibilities at a local force level.

R3. Highways England should continue to develop tailored local IM protocols based on JESIP and CLEAR principles with the Police, other emergency services and other stakeholders, to clarify responsibilities and support Highways England's ability to clear and manage incidents.

R4. Highways England should work with LHAs at a national and regional level to develop more consistent liaison processes and 24/7 contact procedures.

R5. Highways England should continue to support LRFs in seeking ways to distribute welfare effectively, in particular to vulnerable road users.

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Findings - Process stage 1 : Monitor and anticipate

Brief description and responsibilities

For motorways this is carried out by Highways England TO patrols supplemented by cameras or other technology. For All Purpose Trunk Roads (APTRs) monitoring of journey times is carried out through NTIS using 'blue cameras' and Twitter.

Key findings from Highways England engagement

1.1 Motorways are regularly patrolled and monitored by Highways England TOs through the use of technology. There is less patrolling of APTRs and a reliance on traffic flow technology and incidents reported externally.

1.2 It appears that in some cases Police forces may vary their process for reporting the occurrence and status of incidents to Highways England, in particular for incidents that occur on APTRs.

1.3 We are aware of Highways England having recently moved to single-operated patrols in specific circumstances to improve effectiveness and service quality. Single crews are in operation and are being trialled on all-lane running motorways (ALR).

1.4 The introduction of smart motorways, including all-lane running has introduced technology to better detect and manage incidents.

1.5 Highways England is introducing new technology to improve monitoring and incident detection such as automated Stop Vehicle Detection (SVD). SVD is now operational on certain routes including the M25.

Summary findings and recommendations

F5. The relationship between Highways England and the Police is critical to IM and based on established practice such as JESIP and CLEAR principles. However the level of traffic incident experience may vary between police responders on the ground.

R2. Highways England should consider ways to improve the coordination and understanding of IM with the Police at a national level which should lead to better understanding of incident roles and responsibilities at a local force level.

R3. Highways England should continue to develop tailored local IM protocols based on JESIP and CLEAR principles with the Police, other emergency services and other stakeholders, to clarify responsibilities and support Highways England's ability to clear and manage incidents.

F15. Highways England regularly monitors motorways using TO patrols and traffic detection technology. Recent deployment of single TO crews to appropriate incidents provides resource flexibility and balances efficiency with customer needs.

F16. There is less patrolling of APTRs by Highways England and more reliance on traffic flow technology, external incident reporting, and attendance and communication by the Police at incidents. These factors could cause a delay in the TO and service provider response in circumstances where their response is required.

R11. Highways England should consider whether its current approach to managing incidents on APTRs offers road users an appropriate level of service compared to that on motorways.

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Findings - Process stage 2 : Initial response

Brief description and responsibilities

Highways England Control Centre staff are made aware of an incident and grade it according to severity and need and are responsible for coordinating the response and deploying resources. Depending on the nature of the incident the emergency services will also respond accordingly

Key findings from Highways England engagement

2.1 There appear to be several terms used by Highways England for incidents depending on their severity & network importance eg Critical, Major, severe and significant. Major and Critical are defined but other terms seem to be variously used. This could cause confusion which Highways England manages through its experienced staff.

2.2 A lot of Highways England incident decision-making appears to rely on the experience and judgement of the TO control centre operator. While there is an escalation procedure there is a lot of responsibility on one individual to coordinate the appropriate response and consider the impact on lane availability.

2.3 There are a number of examples of good operational practice by Highways England TOs where regional managers make pragmatic decisions to better manage incident clearance, for example putting maintenance teams and vehicle recovery crews on standby, pre-positioning resources and having specialist equipment available.

2.4 Where the Police initially respond to an incident the officer(s) may have varying levels of traffic and incident management experience including of the Motorway environment. Linked to finding 0.7.

2.5 For RCC regions operating with ASCs and DBFOs we are aware that the sequence of calling service providers once the TO has arrived on site creates an additional step and could cause delay to incident clearance.

2.6 The introduction of smart motorways including all-lane running (ALR), where the hard shoulder is trafficked, has introduced technology to better detect and manage incidents. The benefits to IM include the ability to close lanes and create corridors for emergency services and recovery vehicles. The time taken to reach a traffic free corridor can be impacted by the volume of traffic affected by the incident and the time taken to deploy.

Summary findings and recommendations

F1. Highways England manages its Strategic Road Network (SRN) through six regions which have devolved IM decision-making responsibilities. Each region covers several Police forces and other emergency services, and multiple local highway authorities (LHAs). This means there are many interdependencies involved in incident management.

F4. Highways England employs competent experienced IM staff. Significant decision-making is devolved to on-road and control centre incident operator TOs, who receive regular training and coaching.

ORR: Highways England and Incident Management Study

Findings - Process stage 2 : Initial response

Summary findings and recommendations continued...

F5. The relationship between Highways England and the Police is critical to IM and based on established practice such as JESIP and CLEAR principles. However the level of traffic incident experience may vary between police responders on the ground.

F10. The introduction of technology on smart motorways has allowed all-lane running (ALR) in order to increase capacity. During an incident, the smart technology can be used to open up traffic free corridors to allow emergency services, service providers and vehicle recovery to access the incident.

R2. Highways England should consider ways to improve the coordination and understanding of IM with the Police at a national level which should lead to better understanding of incident roles and responsibilities at a local force level.

R3. Highways England should continue to develop tailored local IM protocols based on JESIP and CLEAR principles with the Police, other emergency services and other stakeholders, to clarify responsibilities and support Highways England's ability to clear and manage incidents.

R5. Highways England should continue to support LRFs in seeking ways to distribute welfare effectively, in particular to vulnerable road users.

R6. Highways England should ensure that smart motorways and roads with discontinuous hard shoulders continue to benefit IM and do not constrain access to incidents or the provision of welfare to road users.

ORR: Highways England and Incident Management Study

Findings - Process stage 3 : Scene management

Brief description and responsibilities

Depending on incident criticality and on motorways/APTRs Highways England or the Police control incident scenes including coordination of other emergency services, vehicle recovery and other specialist resources.

Key findings from Highways England engagement

3.1 Highways England's incident clearance KPI is well understood. The need to reopen roads and clear incidents quickly will always need to be carefully managed with Highways England's safety imperative.

3.2 Where the emergency services are involved in an incident their priorities may be different to those of Highways England TOs. This can lead to different priorities to reopen the road which could result in longer incident clearance times. Regional variances in Police experience can also result in different IM practices. There are examples of good practice such as the use of Joint Emergency Services Interoperability Principles (JESIP) and the emerging IM Motorway Protocols. Awareness of JESIP principles by emergency service crews that attend incidents can vary.

3.3 On-site decision-making by Highways England TOs can rely on experience and interpersonal skills such as negotiating with HGV drivers and the emergency services to reopen the road.

3.4 The ability of Highways England TOs to liaise and coordinate with LHAs regarding the suitability of planned diversion routes during an incident varies according to out of hours and availability of LHA resources.

3.5 It appears that some Highways England regions are making greater use of their statutory powers to move vehicles and speed up incident clearance times. This includes immediate deployment and tactical pre-positioning of recovery vehicles.

3.6 It doesn't appear that Highways England TOs would benefit from travelling under 'blue lights' as existing procedures to reach the scene work just as well. Linked to finding 2.6.

Summary findings and recommendations

F5. The relationship between Highways England and the Police is critical to IM and based on established practice such as JESIP and CLEAR principles. However the level of traffic incident experience may vary between police responders on the ground.

F7. Highways England regions intersect with multiple LHAs who have varying levels of emergency contact. This can create difficulties for TOs coordinating traffic diversions, particularly outside daytime hours.

R2. Highways England should consider ways to improve the coordination and understanding of IM with the Police at a national level which should lead to better understanding of incident roles and responsibilities at a local force level.

R3. Highways England should continue to develop tailored local IM protocols based on JESIP and CLEAR principles with the Police, other emergency services and other stakeholders, to clarify responsibilities and support Highways England's ability to clear and manage incidents.

ORR: Highways England and Incident Management Study Findings - Process stage 3 : Scene management

Summary findings and recommendations continued...

F13. Highways England's incident clearance KPI is well understood. The need to reopen roads and clear incidents quickly will always need to be carefully managed with Highways England's safety imperative.

R9. Highways England should ensure that the incident clearance KPI continues to drive the right behaviours.

ORR: Highways England and Incident Management Study

Findings - Process stage 4 : Recovery

Brief description and responsibilities

This includes the on-site debris clearance as well as releasing trapped traffic, repairing any asset damage and road opening. The Highways England traffic officer together with the control centre will coordinate this response

Key findings from Highways England engagement

4.1 The Local Resilience Forum (LRF) is responsible for planning and delivering welfare responses. The application of welfare can vary between regions depending on availability of resources, nature of the incident and the incident timeline. However Highways England has identified examples of best practice in its regions for coordinating welfare provision through LRFs. Highways England is also developing its own customer service standard for welfare, which is intended to set out the requirements and guidance for providing welfare to customers stranded on the SRN during major incidents. This would be planned and delivered on a multi-agency basis under the auspices of the Local Resilience Forums (LRFs).

4.2 Highways England is developing a multi-skilled response capability for its TO staff to speed up incident clearance. TO on-road delivery resources are being trained in asset damage inspections (ROC & RCC model) and a 'find and fix' asset repair capability (ROC only).

4.3 For Highways England's service providers, there is a balance between clearing incidents and providing the best outcomes for customers with managing the needs of Highways England's assets. Linked to finding 3.1.

4.4 We are aware of Highways England developing several innovative processes and technology to re-open roads quickly following an incident and which balance customer needs and efficiency. For example hydro blasting of diesel spillages is used to avoid road surface repairs. Another example of achieving this customer/efficiency balance is running traffic at slow speeds on a temporary road surface, which is used to clear traffic after an incident quickly in peak periods, before repairing the road in the off-peak period. Linked to finding 6.2.

Summary findings and recommendations

F8. As a Category 2 responder under the Civil Contingencies Act, Highways England is a member of Local Resilience Forums (LRFs), and through the LRFs supports Category 1 responders, including emergency services and local authorities, in developing multi-agency plans for provision of welfare to customers in trapped traffic. This relationship is not universally understood by road users which can result in differing expectations of Highways England's role.

F10. The introduction of technology on smart motorways has allowed all-lane running (ALR) in order to increase capacity. During an incident, the smart technology can be used to open up traffic free corridors to allow emergency services, service providers and vehicle recovery to access the incident.

R6. Highways England should ensure that smart motorways and roads with discontinuous hard shoulders continue to benefit IM and do not constrain access to incidents or the provision of welfare to road users.

ORR: Highways England and Incident Management Study

Findings - Process stage 5 : Communication

Brief description and responsibilities

This includes the national NTOC, local and regional ROC/RCC communication practices during an incident and the national oversight of critical incidents by National Incident Liaison Officers (NIOs) and wider network management. Information is provided to the public through a range of channels.

Key findings from Highways England engagement

5.1 Highways England service providers under the RCC model and DBFOs don't have access to the TO command and control systems and are reliant on phone calls to initiate a response. This is different in the ROC where TO staff are connected to the same systems.

5.2 The ROC operating model is focussed on network management and provides Highways England's TOs the opportunity for a more joined up approach to coordinate and communicate incidents and respond to information requests.

5.3 Strategic variable message signs (VMS) are set at a national level by Highways England NTOC. The diversion information during an incident can only be set once the region has confirmed there is a road closure. This is not an automated process and, although communication between the RCCs/ROC and NTOC is good, it can mean additional vehicles have joined the back of the queue in the meantime.

5.4 At both a national and regional level Highways England uses pre-defined email distribution lists to ensure key stakeholders are updated with incidents and incident clearance progress. Keeping these distribution lists current is an important, ongoing task.

5.5 Highways England places a high value of the use of Twitter at a national and regional level. This is one of the channels used to inform road users and other stakeholders. Highways England should ensure that this doesn't neglect the needs of other users who may not use Twitter as a means of obtaining information.

5.6 Highways England and the emergency services use Airwave radio. This is due to be replaced by an improved Emergency Service Network (ESN). The replacement programme has slipped. This could delay Highways England's ability to make planned improvements to its communications protocols with the emergency services during incidents.

ORR: Highways England and Incident Management Study

Findings - Process stage 6 : Continuous improvement

Brief description and responsibilities

This includes the learning from incidents using hot/cool/cold debriefs as well as trials and adoption of technology, processes and materials to improve incident management

Key findings from Highways England engagement

6.1 There are many examples of how Highways England has used the learning from incidents to trial and adopt good practice to improve incident management. This good practice is typically developed locally and not necessarily routinely adopted nationally to other regions.

6.2 The application of Highways England standards relating to long-term asset risk, safety and performance can cause tensions with the need to clear incidents quickly. This can apply to innovative solutions and temporary repairs which could help speed up incident clearance, but are constrained in their use by existing asset standards. Linked to finding 4.4 and 6.1.

6.3 The Highways England incident debrief process is an important opportunity to gain multi-responder feedback and potential improvement actions from those involved in an incident. It is often difficult for Highways England regions to get the emergency services crews that were present at an incident to the debriefs. This dilutes the potential for learning and consistency of incident management practice, both for Highways England and for these emergency services crews.

Summary findings and recommendations

F9. Highways England has examples of local innovation and good practice leading to improved incident clearance.

R7. Highways England should ensure that local innovation and good practice that can benefit IM is brought into routine operation nationally as quickly as possible.

ORR: Highways England and Incident Management Study

Findings - Process stage 7 : Performance monitoring and reporting

Brief description and responsibilities

This includes the measurement of incident management, related targets and incentives and operational reporting.

Key findings from Highways England engagement

7.1 Highways England's current incident management Key Performance Indicator (KPI) requires it to clear at least 85% of incidents on its motorway network within one hour. It is applied when incidents impact running lanes on motorways. The measure has a variety of assumptions which limit its use as a 24/7 measure that can be applied to the entire Strategic Road Network (SRN). However it is acknowledged as a simple and clear delay measure. Future metrics are being considered as part of development of the next Road Investment Strategy (RIS 2).

7.2 The lane impacted duration is calculated from the time period that the Highways England RCC/ROC Control Centre operator operates the 'lane impacted' button in Control Works. This calculation is not automatic and relies on the operator starting/stopping the lane impacted recording as the incident evolves.

7.3 Highways England ASC providers have incident attendance KPIs and different targets to attend incidents. Targets depend on whether incidents are led by the emergency services or TOs and on the time of day and traffic volume.

7.4 Highways England KPI performance is calculated weekly and monitored internally on a monthly basis. It is reported monthly to ORR. Highways England has improved its incident clearance performance and has met the 85% target nationally and regionally in 2017-2018.

7.5 There are significant reputational issues to Highways England arising from incidents that impact running lanes and those that exceed the KPI target time. Highways England's incident clearance KPI does not incentivise clearance within/outside the target.

7.6 Highways England operates graded PIs for its NGVR contract with an attendance target and long-stop attendance target. There are financial penalties but no financial incentives. All PI targets have been met over the last 12 months.

7.7 There does not appear to be any coordinated analysis of the impacts between the incident clearance KPI and other Highways England KPIs and PIs.

7.8 Analysis of Highways England ASC service provider KPIs shows all regions are meeting or exceeding their attendance performance targets.

Summary findings and recommendations

F11. Highways England's KPI for incident clearance is limited to motorways and for incidents that occur within certain hours. Future IM metrics are being considered as part of the development of the second Road Investment Strategy (RIS 2).

F12. Highways England exceeded its target for incident clearance in 2017-18 both nationally and across its regions.

F13. Highways England's incident clearance KPI is well understood. The need to reopen roads and clear incidents quickly will always need to be carefully managed with Highways England's safety imperative.

ORR: Highways England and Incident Management Study

Findings - Process stage 7 : Performance monitoring and reporting

Summary findings and recommendations continued...

R9. Highways England should ensure that the incident clearance KPI continues to drive the right behaviours.

R10. In the development of performance measures for RIS2 and future road periods, Highways England should consider how it can improve incident management data across the whole SRN.

Findings from comparator survey

ORR: Highways England and Incident Management Study

Comparator survey findings

Survey introduction and organisation types

This section includes the key findings from responses to the comparator survey based on four key areas:

- A) Incident management processes
- B) Measurement and metrics
- C) Targets and incentives
- D) Interaction between performance measures

Organisations that responded to survey	Road agency	Service Manager	Operator	Maintainer	Operator & Maintainer	Recovery	Stakeholder	Other	Totals
UK Highways			4	1	1	1	1	1	9
UK Infrastructure					2				2
International Roads	4	2	5	1	1				13
Sub-Totals	4	2	9	2	4	1	1	1	24

A Incident management processes

A.1 *Incident definition* – most organisations broadly follow the Highways England definition of an incident used in this study but some organisations include both ‘cause and effect’ i.e. the impact and disruption to traffic and the asset.

A.2 *Incident management customer information tools* – organisations use similar customer information outlets to Highways England including Variable Message Signs (VMS), social media, web, radio, press. In the UK, Network Rail and the Train Operating Companies (TOCs) also make significant use of Twitter to provide information to customers and to receive real time information. Note: in France operators are required to set VMS within 3 minutes of an incident and **within 2 minutes on the dedicated national radio motorway channel Radio 107.7**

For details of A2. see table on next page

A.3 *Incident management process review procedures* – Austria holds formal 6-monthly review sessions with the emergency services to share lessons learned and update guidance. In contrast Highways England does not appear to have national level review sessions. In Denmark all incidents causing more than 2 hour delay are formally evaluated. In the UK rail sector, incident briefings are held, followed by a formal investigation, to ensure lessons are learnt and collective knowledge is not lost.

A.4 *Mitigation measures used to reduce the impact of incidents* – In Denmark a trial to control and adjust signals on diversion routes is being tested for network optimisation in the event of an incident. This could be of potential interest to Highways England and LHAs to coordinate and manage diverted traffic.

ORR: Highways England and Incident Management Study Comparator survey findings – A2 Incident management customer information tools*

Organisation	Country	VMS	Variable speed signs	Open data	Broadcast Radio	Emails	Websites / Apps	Media liaison	Social media	Text messaging	Via 3 rd party	Recorded phone messages	LRFs	TV	Warning service	Audible warnings
Midland Expressway Limited	England	✓							✓							
South Wales Trunk Road Agent	Wales	✓	✓	✓	✓		✓		✓							
Egis road operation M40 ltd	United kingdom										✓					
Transport for London	UK	✓	✓	✓	✓	✓	✓		✓							
Severn Trent	England and Wales				✓		✓	✓	✓	✓		✓	✓	✓		
Environment Agency	England					✓		✓	✓						✓	✓
ASFINAG	Austria	✓	✓		✓		✓									
Queensland Department of Transport and Main Roads	Australia	✓		✓	✓		✓									
Vejdirektoratet (Danish Road Directorate)	Denmark	✓	✓	✓	✓		✓							✓		
Hanshin Expressway Corp.	Japan	✓	✓	✓	✓	✓	✓	✓	✓							
MidLink M7M8 Ltd	Ireland	✓									✓					
Egis Exploitation Aquitaine	France	✓			✓											
Rijkswaterstaat	Netherlands	✓	✓	✓			✓		✓							

* Note that respondents were asked for a free text response to the following question: “What tools do you use to inform your customers about an incident on your network eg variable/dynamic message signs, variable mandatory speed limits, variable advisory speed limits, open data, broadcast radio, your organisation website, media websites, other”. This may not present an exhaustive picture of all information tools used across respondents' IM processes.

ORR: Highways England and Incident Management Study

Comparator survey findings

A Incident management processes continued

A.5 Proactive data solutions used to speed up incident clearance – some organisations including recovery vehicle operators are using incident heat maps to predict and pre-deploy. Transport for London (TfL UK) and Australia are collaborating with 3rd party data providers to assist in faster detection. The Netherlands, like Highways England, uses floating car data to identify traffic flows.

A.6 Proactive information solutions used to speed up incident clearance – Denmark’s Traffic Centre is one of the services to receive direct 112 calls (112 is the national emergency number) which allows the Danish Road Directorate (DRD) to respond quickly. Highways England is considering a similar 3-digit call number.

A.7 Proactive collaboration solutions used to speed up incident clearance – all organisations work closely with emergency services and other stakeholders, while, like Highways England, the UK rail sector has adopted the ‘gold silver bronze’ emergency services command structure for major incidents. TfL have a central control centre with all transport modes (road/rail/transit). Australia has an Alliance Agreement with emergency services for Road Operations, including a Partnering Agreement for Traffic Incident Management. Australia like Highways England shares CCTV images with emergency services.

A.8 Other proactive solutions used to speed up incident clearance – Australia has an underlying theme of seeking marginal gains to get more out of incident management. Japan deploys its own towing vehicles with special troopers which can be dispatched faster. Belgium’s highway authority also deploys its own recovery vehicles under its FAST programme (Clearing Tailbacks through Fast Interventions).

A.9 Most effective solutions to quickly restore incidents – information to detect, communication, collaboration, training and preparedness were common among organisations’ top three solutions. Australia highlighted mutual understanding of partner roles and responsibilities as an effective solution. The UK Train Operating Companies (TOCs) have contracts with local bus and taxi companies to provide alternative transport for rail passengers affected by planned maintenance and incidents.

A.10 Factors to depart from incident management processes – the most common factors to depart identified by respondents included the incident location and type followed by major works and seasonal weather. TfL incident management processes allow for dynamic decision making based on multiple incident factors. In France this is based on coordination with local authorities and the police.

Summary findings and recommendations

R8. Highways England should consider whether international practices such as a national traffic radio channel (used in France) and a 3-digit national emergency number for traffic incidents shared with emergency services (used in Denmark) would benefit IM.

ORR: Highways England and Incident Management Study

Comparator survey findings

B Measurement and metrics

B.1 Internal / external incident performance measurement and measurement aspects – most organisations measure IM internally with a broadly equal split between those that measure IM as part of an external framework. Most other countries surveyed as part of this study have either a response or clearance time based measure, the latter being similar to Highways England. Some countries measure other service aspects. Some measure delay, level of service, customer satisfaction and asset damage. A few organisations measure the cost of incidents. The Netherlands measures value for money. Japan measures the volume of traffic jams and Denmark measures socioeconomic lost time.

For details of B1. see table on next page

B.2 Details of incident management performance measures – most organisations measure response times and clearance times together with journey reliability and customer satisfaction. Note:

- Australia has a cost of congestion methodology
- Denmark analyses incident cost and delays via a socio economic method and measures the socioeconomic cost due to delays/queues.

B.3 The use of incident management performance measurement to drive improvement – all organisations have used IM measurement to drive change and/or improvement and there are several examples of using data and real-time measurement to pre-deploy IM vehicles. Note:

- Australia - understanding cost of incidents is critical for business cases relating to improvements

B.4 The relationship between incident management and service performance – most organisations operate the same level of service across their network but adjust this for the time of day/night and weekdays/weekends.

- Japan offers the same level of service 24/7
- TfL UK operates dynamic decision making in response to changing factors encountered during an incident including location, time of day, network demand, weather conditions etc
- **Australia targets incident response services at the high risk/high value parts of the network. Queensland is a very broad state ranging from urban to rural, and its response services vary significantly across the state.**

Summary findings and recommendations

F14. Most other countries surveyed have either a response or clearance time based measure for incident clearance. Some countries measure other service aspects.

F17. Other countries operate a single level of service for IM across their entire network, or adjust their level of service based on the likelihood of incidents and the needs of their network.

R11. Highways England should consider whether its current approach to managing incidents on APTRs offers road users an appropriate level of service compared to that on motorways.

ORR: Highways England and Incident Management Study

Comparator survey findings - B.1 *Internal / external incident performance measurement and measurement aspects*

		What aspects of incident management performance do you measure?							
Organisation	Country	Time	Delay	Cost	Value for money	Level of service	Customer satisfaction	Asset damage	Other (please specify)
Midland Expressway Limited	England	✓	✓			✓	✓		
Transport Focus	Great Britain		✓				✓		
South Wales Trunk Road Agency	Wales	✓				✓			
Egis road operation M40 ltd	UK	✓	✓	✓		✓		✓	
Connect Plus Services	UK	✓	✓	✓				✓	
Kier (local authority road management)	UK	✓	✓				✓	✓	
AVRO	UK + Ireland	The Institute of Vehicle Recovery captures data of IM within the roadside recovery industry							
Transport for London	UK	✓	✓			✓	✓		
Severn Trent	England + Wales		✓	✓			✓	We record issues required by our regulators.	
Environment Agency	England					✓			
ASFINAG	Austria	✓	✓			✓	✓	✓	
Queensland Department of Transport and Main Roads	Australia	✓		✓	We report on average clearance times of certain incident types as part of corporate reporting, and also do analysis of the cost of incidents (however ad-hoc)				
Federal Highway Administration	USA	✓							Secondary impacts
Vejdirektoratet (Danish Road Directorate)	Denmark	✓	✓	✓		✓			Socio economic time lost
Hanshin Expressway Corp.	Japan	✓	✓	✓		✓	✓	✓	Volume of traffic jams
MidLink M7M8 Ltd	Ireland	✓	✓						
Agency for Roads and Traffic	Belgium								
Egis Exploitation Aquitaine	France	✓	✓						
Rijkswaterstaat	Netherlands	✓	✓	✓	✓	✓			

ORR: Highways England and Incident Management Study

Comparator survey findings

C Targets and incentives

C.1 *The use of specific incident management performance targets* – of the organisations that responded all have a contractual target value, some have a target range and two-level target and only a few have a desirable target value.

For details of C1. see table on next page

C.2 *Incentives and penalties for incident management performance* – all organisations operate with penalties largely based on service points with only a few based on monetary value. Note: A trade body for the UK vehicle recovery trade noted “UK vehicle recovery contractors are not usually financially penalised, however are KPI measured. Due to the severity of the work and incidents the roadside recovery industry engages in they do not feel that incentives / penalties should be applied. Incidents should be attended and managed by an operator with reliant skills, knowledge and experience fitting to the incident in hand.”

Summary findings and recommendations

F17. Other countries operate a single level of service for IM across their entire network, or adjust their level of service based on the likelihood of incidents and the needs of their network.

R11. Highways England should consider whether its current approach to managing incidents on APTRs offers road users an appropriate level of service compared to that on motorways.

ORR: Highways England and Incident Management Study

Comparator survey findings - C.1 *The use of specific incident management performance targets*

Organisation	Country	Specific incident management targets				
		Target description	Target range (min to max)	Target value (min to achieve)	Desirable value (stretch value)	Other variable
Midland Expressway Limited	England	Response and clear up times				
South Wales Trunk Road Agent	Wales	Response time to incident	20 minute target response time for 80% of incidents between 0700 and 1900			
Egis road operation M40 ltd	UK	Response target of 76% attendance within 20 minutes.	76% minimum to 100% maximum	76%	95%	
Connect Plus Services	UK	Response time	5 - 40 mins	95%		
The Association of Vehicle Recovery Operators Limited	UK + ROI	For incidents attended under Highways England or Police request, AVRO members are usually subject to contractual KPIs including swift removal of vehicle and obstruction targets				
Transport for London	UK	Incident Resolution		90 mins to return network to normal operation		
Severn Trent	England and Wales	Alternative supplies targets (quantity and time)	Varies depending on customer vulnerability		This is an example of a target. Water incidents are many and varied and the metrics will depend upon the situation.	
ASFINAG	Austria	Some internal KPIs: Average incident duration (from detection to clearance), Number and average duration of complete closings, Response time from the receipt of the emergency call to the arrival of the ASFINAG officer in charge at the scene				
Vejdirektoratet (Danish Road Directorate)	Denmark	Response times (from being ordered by Traffic Center to arriving at incident) dependent on road type, time of day and nature of the service. Example: A: Most heavily trafficked motorways (20 mins to 30mins), B: Other motorways and other specifically defined roads (30mins to 45mins), C: Other public road network (180mins). Reported KPIs cover response times, average clearance times for major incidents, and Traffic Center operations.				
Queensland Department of Transport and Main Roads	Australia	Clearance times	Targets not provided		Targets not provided	
MidLink M7M8 Ltd	Ireland	60 min response time during work hours and 90 min outside working hours	0-60 and 0-90 minutes accordingly	60, 90	as low as possible	
Rijkswaterstaat	Netherlands	Arrival time after detection on the scene	80% within 15 min during rush hours for traffic officers	80% within 30 min out of rush hours for traffic officers	80% within 20 min overall	Arrival time of towing company (90% within 20 min)

ORR: Highways England and Incident Management Study

Comparator survey findings

D Interaction between performance measures

D.1 The interaction between different organisational performance measures – of the organisations that responded most are similar to Highways England and do not assess the “interaction” or “relationship” between incident clearance and other performance measures. Transport Focus measures road user satisfaction with the SRN through its National Road Users' Satisfaction survey, while SWTRA assesses a range of measures including safety, service delivery, customer satisfaction, cost, efficiency and value for money. Japan measures the total traffic jam caused by an incident and Ireland measures incident numbers, response times and rates, complaints and costs.

D.2 Comparator view of the contribution of incident management to the equivalent of Highways England's strategic objectives – in terms of the priority (High, Medium, Low) that IM provides to an organisation's overall service provision the following top four were aligned with Highways England's priorities:

- Making the Service Safer – (90% of organisations rated this as High) this is universally a paramount priority for both road users and customers.
- Improving Customer Satisfaction – (80% of organisations rated this as High) customers are key to all IM decisions; for commercial organisations this also impacts revenue and ability to maintain and grow customer base.
- Supporting a Smooth Service (includes network availability) – (75% of organisations rated this as High) another key priority but not at the detriment of safety.
- Achieving Service Efficiency – (60% of organisations rated this as High) more efficient traffic flow in case of incidents and fewer queues. Also in a world of competing priorities, being efficient in service delivery is key to sustainability.

Findings from literature review

ORR: Highways England and Incident Management Study

Literature review findings

Brief description

This includes the key findings from a review of selected IM guidance following a triage of extensive IM documentation based on:

- General background – does not offer potential for Highways England IM learning
- Future direction – identifies future IM challenges of potential interest to Highways England IM
- Highways England specific – current Highways England IM guidance or case studies
- Potential comparison – of interest to compare to Highways England IM.

L1. Connecting the Country: planning for the long term (Highways England 2017) - This identifies 9 key trends over 3 core areas. Most of these will have an impact on IM or will be supported by IM such as increased network demand and resilience, opportunities to use improved data and provide better customer information.

L2. Incident Management Manual (IMM) (Highways England draft) – this will become Highways England’s national IM guidance as part of the ROC operating model and builds on Highways England’s existing IM guidance. It will provide national consistent practice. It is in draft and due to be rolled out in 2019. The IMM defines the incident timeline (similar to the PRIMA timeline below) and the command and escalation principles follow the JESIP principles of ‘co-locate, communicate, co-ordinate, jointly understand risk and shared situational awareness’.

L3. PRIMA (Proactive Incident Management) Stakeholder Consultation (CEDR 2015) – this European survey found that peak hour traffic and HGVs were the factors most likely to lead to incidents. IM measures adopted by organisations are mainly time-based however there is a common issue with inconsistency of data collection. VMS is the key customer information tool. The main reasons cited for not deploying technology innovation quicker are uncertainty of cost / funding followed by uncertainty of benefits and integration with existing technology.

L4. PRIMA Analysis – this highlights incident preparation, anticipation and monitoring and incident responsibilities as the largest areas of potential improvement.

ORR: Highways England and Incident Management Study

Literature review findings

Literature findings continued

L5. *International benchmark of Traffic Incident management (DRD 2018)* – this European road agency survey that included Austria, Denmark, Netherlands, Sweden, Switzerland and UK identified common issues and best practices for operating and improving IM. Best practice is identified for each IM timeline stage. **Of note is that the UK and Netherlands are leading many areas of IM and are considered to be providing best practice in many areas.**

F0. Highways England is recognised as a European leader in incident management (IM)

L6. *CHARM* - is a cooperation of Rijkswaterstaat and Highways England to migrate to an Advanced Traffic Management System (ATMS), supporting network management processes. It is an ongoing programme of IT system development which will benefit Highways England.

L7. *IM Guide to Work Processes (IM-werkprocessenboek (English language version of Netherlands operational document, 2011))* – this provides a summary of IM process stages including the responsibilities of emergency services and IM stakeholders. It includes useful guidance about the required capabilities of the IM workforce and the scalability of incident management techniques.

L8. *Traffic Incident Management Handbook (US DOT 2000)* – this guidance provides a strategic framework for US states to develop their local IM processes and procedures. There is not much tactical guidance. Of note is the US vehicle removal law and indemnity provided to incident responders. Also of note is the Move Over law which protects incident responders by providing specific requirements for motorists' reactions when approaching an incident scene. These laws provide for an additional "buffer zone" between the emergency vehicle and traffic. When approaching a stationary emergency vehicle displaying emergency lights or amber lights in general, Move Over laws require that motorists must:

- change lanes into an available lane that is not adjacent to the stationary emergency vehicle, but only if a lane change can be made safely
- slow down and be prepared to stop if a lane change is not possible.

The laws specify that these actions be taken when no other traffic direction is being given by an enforcement officer.

Appendices

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Glossary of terms

Acronym	Description	Acronym	Description	Acronym	Description
AD	Asset Delivery Contract	FAST	Clearing Tailbacks through Fast Interventions	NTIS	National Traffic Information Service
ALR	All Lane Running			NTOC	National Traffic Operations Centre
APTR	All Purpose Trunk Road	HGV	Heavy Goods Vehicle	OMM	Operational Metrics Manual
ASC	Asset Support Contract	HML	High Medium Low	ORR	Office of Rail and Road
ATMS	Advanced Traffic Management System	IM	Incident Management	PI	Performance Indicator
		IMM	Incident Management Manual	PRIMA	Proactive Incident Management
CAV	Connected and Autonomous Vehicles	IMRT	Incident Management Requirements Team	RCC	Regional Control Centre
CCTV	Closed Circuit Television	JESIP	Joint Emergency Services Interoperability Principles	RIS	Road Investment Strategy
CEDR	Conference of European Road Directors	KPIs	Key Performance Indicator	ROC	Regional Operations Centre
		LHA	Local Highway Authority	SRN	Strategic Road Network
CLEAR	Collision, Lead, Evaluate, Act, Re-opened	LRF	Local Resilience Forum	SVD	Stop Vehicle Detection
		NCC	Network Control Centre	SWTRA	South Wales Trunk Road Agency
CMM	Crisis Management Manual	NGVR	Next Generation Vehicle Recovery	TO	Traffic Officer
CoO	Concept of Operations	NILO	National Incident Liaison Officer	TfL	Transport for London
DBFO	Design, Build Finance and Operate	NNM	National Network Manager	UK	United Kingdom
		NOMS	Network Occupancy Management System	US DOT	United States Department of Transportation
DRD	Danish Road Directorate			VMS	Variable Message Sign
EAM	Elliott Asset Management Ltd				
ESN	Emergency Service Network	NRUSS	National Road Users' Satisfaction Survey		

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